

What Is Claimed Is:

1. A fuel injection control device in which fuel injected into a combustion chamber is ignited after a pre-mixing period has elapsed following a completion of an injection of the fuel, comprising:

target pre-mixing period determining means for determining the target pre-mixing period on the basis of engine operating conditions ;

actual pre-mixing period detection means for detecting an actual pre-mixing period; and

pre-mixing period adjustment means for adjusting a pre-mixing period of the fuel so that the actual pre-mixing period approaches the target pre-mixing period.

2. The fuel injection control device according to claim 1, wherein the actual pre-mixing period detection means comprise injection completion timing detection means for detecting a completion timing of an injection of the fuel, and ignition timing detection means for detecting an ignition timing of the fuel.

3. The fuel injection control device according to claim 2, wherein the ignition timing detection means comprise any one or a combination of a cylinder internal pressure sensor which detects a pressure inside the combustion chamber, an ion sensor disposed inside the combustion chamber, and an acceleration sensor which detects an acceleration of an internal combustion engine.

4. The fuel injection control device according to claim 1, wherein the pre-mixing period adjustment means control the injection timing and/or injection pressure of the fuel.

5. The fuel injection control device according to claim 1, wherein the pre-mixing period adjustment means comprise any one or a combination of exhaust gas recirculating means for recirculating exhaust gas into the combustion chamber, a variable compression ratio mechanism for varying a compression ratio by altering a volume of a combustion chamber, a variable valve timing mechanism for varying the compression ratio by varying an

opening-and-closing timing of intake and exhaust valves, and injection means for injecting a liquid such as water, alcohol or the like into the combustion chamber.

6. The fuel injection control device according to claim 1, wherein the injection timing of the fuel is determined on the basis of the target pre-mixing period determined by the target pre-mixing period determining means, and the target ignition timing.

7. The fuel injection control device according to claim 6, wherein the target ignition timing is in the vicinity of compression top dead center of the piston.

8. A fuel injection control method in which fuel injected into the combustion chamber is ignited after a pre-mixing period has elapsed following a completion of a fuel injection, comprising the steps of:

determining a target pre-mixing period on the basis of engine operating conditions ;  
detecting an actual pre-mixing period; and  
adjusting the pre-mixing period so that the actual pre-mixing period coincides with the target pre-mixing period.

9. The fuel injection control method according to claim 8, wherein the step of adjusting the pre-mixing period includes a step of adjusting the injection timing and/or injection pressure of the fuel.

10. The fuel injection control method according to claim 8, wherein the step of adjusting the pre-mixing period includes one or a combination of the steps of adjusting EGR rate, adjusting a compression ratio, and adjusting a temperature of a mixture.